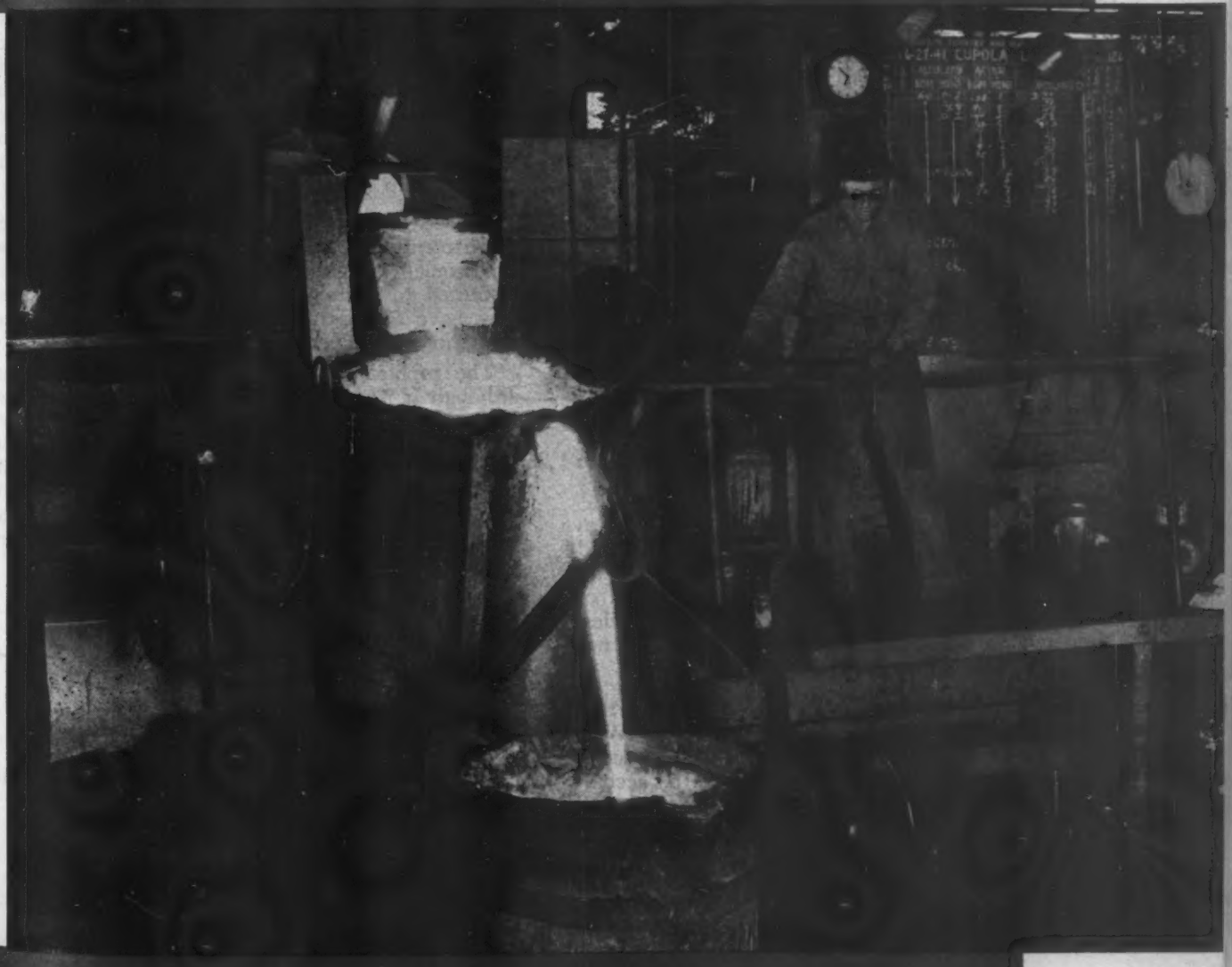
East England Library

MAY 2 1944

ENROLL YOUR PLANT 100% IN THE "10% OF PAYROLL" PLAN!

American Foundryman

A PUBLICATION PRESENTING ASSOCIATION AND CHAPTER ACTIVITIES



Tapping 54-inch Cupola. (Courtesy Lodge Foundry & Machine Co.)

Value of Radiographic Inspection to the Small Foundry, See Page 2. Guard Saves Fingers at Grede Foundry, See Page 4. Time Study Applied to Cost Control, See Page 5. A.S.T.M. Committees Meet at Foundry Congress, See Page 9.

May 1944

Foundry Maintenance Plays An Important Wartime Role

The Situation. The war has imposed a tremendous load on the maintenance departments of most foundries, many of which lacked the time to overcome the deferred maintenance of the depression period when the war broke out. Depleted stocks of materials and spare parts, and insufficient competent personnel for the job at hand was the picture confronting most maintenance departments when practically overnight the plants had to operate on an over-capacity basis. To this was added the new difficulties incident to government control.

Many foundries have been enlarged and practically all have found it necessary to establish a 24-hour basis to take care of the greatly increased demands of the war. Some of the new equipment installed has brought complications due to automatic or semi-automatic control, such as electrical, hydraulic and pyrometric. War conditions have, in some instances, forced the installation of equipment and the use of materials not entirely satisfactory.

The Objective. The objective, of course, is obvious—to maintain the plant in satisfactory operating condition as close to nearly 100 per cent of the time as possible during the war production period, and to have it in good condition for post-war production.

What to Do About It. Each plant will have its own peculiar problems, but operating management should recognize the difficulties of the situation and extend the utmost cooperation and assistance. A word of encouragement to the fellow who has struggled desperately against odds to keep the plant going will not be amiss. The following should be considered:

PREVENTIVE MAINTENANCE: The statement that preventive maintenance is best still applies. Wartime limitations of materials and men may restrict the extent of preventive work which can be accomplished, but keep at it as far as possible.

INSPECTION: Periodic, systematic inspection and follow-up is one of the best ways of preventing breakdowns, as the trouble in many cases can be foreseen and precautions taken. This also includes a check on lubrication, wear, weaknesses, abuse, etc.

MATERIALS: Inspection and experience indicates which materials and spare parts should be on hand. This is a difficult matter these days since more time is required than normally for delivery, and often substitutes must be considered. Repair parts may have to be made in your own shop rather than wait for delivery. The plant engineering department can be of great help in such matters.

PERSONNEL: Fortunate, indeed, is the maintenance department with a force of experienced men. Lacking this, some systematic educational system should be instituted to train men for the specific jobs. They may have to be trained as specialists, due to time limitations for education.

The problem of maintenance is always with us, although it is aggravated by war conditions. However, the proper attitude by management and systematic thought and action by the maintenance and engineering departments should keep it within reasonable bounds. Our approach to the problem should always keep in mind the post-war period as well as the existing war period. In this light, foundry maintenance acquires its important wartime role.

Jas. Thomson

JAMES THOMSON, *Chairman*
A.F.A. Plant and Plant Equipment Committee.

James Thomson, chief engineer, Continental Foundry & Machine Co., East Chicago, Ind., was born in Glasgow, Scotland. He has devoted his entire business career to the iron and steel industry, serving on various A.F.A. committees and as chairman of the Chicago Chapter.

American Foundryman

A.F.A. OFFICERS AND DIRECTORS

PRESIDENT, L. C. WILSON*
Reading Steel Casting Div.,
American Chain & Cable Co., Inc.,
Reading, Pa.

VICE-PRESIDENT, R. J. TEETOR*
Cadillac Malleable Iron Co.,
Cadillac, Mich.

DIRECTORS
Term Expires 1944

R. J. ALLEN*
Worthington Pump & Machinery Corp.,
Harrison, N. J.

J. G. COFFMAN
Los Angeles Steel Casting Co.,
Los Angeles, Calif.

M. J. GREGORY
Caterpillar Tractor Co., Peoria, Ill.

VAUGHAN REID
City Pattern Foundry & Machine Co.,
Detroit, Mich.

L. N. SHANNON
Stockham Pipe Fittings Co., Birmingham, Ala.

DIRECTORS
Term Expires 1945

J. E. CROWN
U. S. Navy Yard, Washington, D. C.

H. S. SIMPSON
National Engineering Co., Chicago

I. R. WAGNER
Electric Steel Castings Co., Indianapolis, Ind.

S. V. WOOD*
Minneapolis Electric Steel Castings Co.,
Minneapolis, Minn.

W. L. WOODY
National Malleable & Steel Castings Co.,
Cleveland, Ohio.

DIRECTORS
Term Expires 1946

D. P. FORBES*
Gunite Foundries, Inc., Rockford, Ill.

ROY M. JACOBS
Standard Brass Works, Milwaukee, Wis.

MAX KUNIANSKY*
Lynchburg Foundry Co., Lynchburg, Va.

HARRY REITINGER
Bethlehem Steel Co., Bethlehem, Pa.

WM. B. WALLIS
Pittsburgh Lectromelt Furnace Corp.,
Pittsburgh, Pa.

Members, Executive Committee

HEADQUARTERS, Room 1398, 222 West Adams St., Chicago, Ill.

STAFF

R. E. KENNEDY, *Secretary*
N. F. HINDLE, *Assistant Secretary*

C. E. HOYT, *Treasurer*

J. REININGA, *Assistant Treasurer*
W. W. MALONEY, *Assistant Secretary*

CONTENTS

MAY, 1944
VOL 6—No. 5

	Page
Foundry Maintenance Plays an Important Wartime Role, *by Jas. Thomson*	Inside Front Cover
The Value of Radiographic Inspection to the Small Foundry, *by Robert Taylor*	2
Guard Saves Fingers at Grede Foundries	4
Time Study Applied to Cost Control, *by Phill Carroll, Jr.*	5
A.S.T.M. Committees Meet at Congress	9
3 Babies in a Year!	10
Members and Guests Cooperate in Congress Housing Situation	11
Foundry Contest for Technology Students	11
A.F.A. Chapter Activities	12
Abstracts of Current Foundry Literature	15
Schedule of May A.F.A. Chapter Meetings	17

The American Foundrymen's Association is not responsible for statements or opinions advanced by authors of papers printed in its publications.

Published by the American Foundrymen's Association, Inc., 222 West Adams St., Chicago, Ill., for the purpose of presenting Association and Chapter activities. Published monthly. Subscription price, to members, $1.00 per year; to non-members, $1.50 per year. Single copies, 20c.

Entered as second class matter July 22, 1938, at the post office at Chicago, Illinois, under the Act of March 3,1879.

The Value of Radiographic Inspection to the Small Foundry

By Robert Taylor, State College of Washington, Pullman, Wash.

Radiographic Inspection, according to the author, is an important cost saver in the small foundry. The value of this non-destructive method of inspection is not limited to the detection of imperfect castings; rather, emphasis should be placed upon its worth as a means of improved foundry control for the production of sound castings.

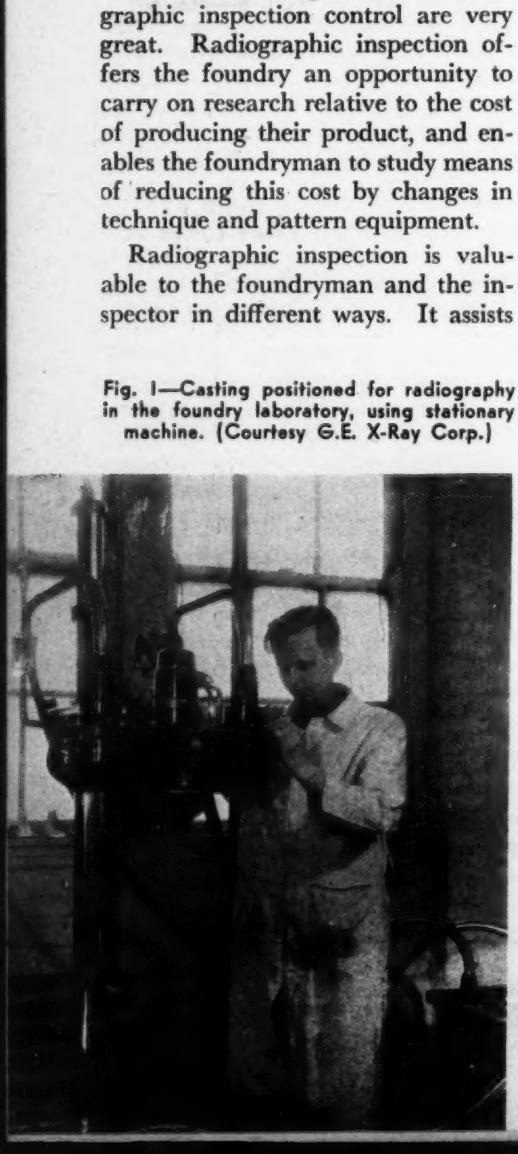
A VOLUNTARY adoption of radiographic inspection, in the belief that this form of non-destructive investigation will, incidental to the savings in cost it may bring about, improve the quality of the product and inspire the confidence of the trade, constitutes the basic consideration for its acquisition in the foundry.

Radiographically, inspecting a pilot casting in the foundry enables the foundryman to locate and correct a faulty procedure at its source.

A great many small foundries are casting light alloys, under contract to aircraft producers, some of them in more or less remote localities, separated by considerable distance from large cities where they might turn to a commercial laboratory to assume their responsibilities of radiographic inspection control. For such foundries the advantages and economies of establishing their own radiographic inspection control are very great. Radiographic inspection offers the foundry an opportunity to carry on research relative to the cost of producing their product, and enables the foundryman to study means of reducing this cost by changes in technique and pattern equipment.

Radiographic inspection is valuable to the foundryman and the inspector in different ways. It assists the foundryman in perfecting the foundry technique so that satisfactory castings are produced, and it enables the inspector to reject castings which are unsatisfactory. There is a corresponding difference in the deductions that the foundrymen and the inspector make from the direct or geometrical information obtained from the film.

Fig. 1—Casting positioned for radiography in the foundry laboratory, using stationary machine. (Courtesy G.E. X-Ray Corp.)



Deductions Vary

The foundryman may deduce information about the cause of the defect. He makes such a deduction when he calls a cavity a "gas" cavity, or a "shrinkage" cavity.

Such information, regarding the cause of defects is of interest to him because he wishes to improve his foundry technique by eliminating the causes.

The inspector, acting on behalf of the customer, is more interested in the strength of the casting than in the cause of defects. Whereas the cause of a defect offers something of a mechanical importance, if the inspector can learn to associate a certain mechanical weakness with a definite appearance on the radiograph, the cause of the defect is immaterial to him.

Until quite recently radiographic inspection has been carried out by the foundryman's customer on a mass-inspection basis for the purpose of culling out defective castings, with insufficient thought given to utilizing such inspection as a means of improving methods in the foundry, to the end that rejections would be reduced to a minimum.

A Means of Improvement

Heretofore, first consideration was given to sorting out, by radiographic inspection, and returning to the foundry defective castings, and second thought given to utilizing radiographic inspection as a creative means for improving the foundry product by design changes, where indicated, by correction of faulty foundry practice and by improvement in pattern equipment. The opinion now is that this emphasis should be reversed and first consideration given to utilizing the method as a creative means for improving methods in the foundry.

The reversal of such an emphasis is entirely logical, since the most vital service which the non-destructive radiographic test can perform is in rendering information to the foundry on the quality of the product it is producing, in relation to the quality that could be produced with adequate foundry control.

The establishment of close coordination between designers, inspection and purchasing departments and the foundry is essentially important in carrying out an efficient quality control program. In this, it is vitally important that the results of inspection by the customer be made available to both the designer and foundryman in order that, where indicated, changes in design or correction of faulty foundry technique may be expedited. The control of rejections on castings can be accomplished without undo difficulty by improving pattern equipment and technique.

Design Is Often Faulty

An analysis will usually point out that if a certain defect persists (excluding dross and porosity) the design is usually faulty. On the other hand, if various miscellaneous defects intermittently appear, it is more often the fault of technique.

Radiographic inspection should be intelligently controlled and correlated with the structural importance of the part, and with the static test for establishment of fair standards for each design. Correlation between the radiographic findings and the static test strength may be accurately determined only when the defects lie in an area of critical stress. Such correlation is both quantitative and comparative.

Drawings should be furnished the

foundry illustrating the direction and point of application in all stressed sections, as a great many discontinuities not appearing in highly stressed sections of a casting should not be cause for rejection unless they are excessive.

Defects which appear in the radiograph bear heavily on the impact and fatigue strength of a casting, and they show greater effect than on the static strength. A properly exposed radiograph will divulge within reasonable limits reliable information as to the size, location and identity of discontinuities.

Determination of Apparatus

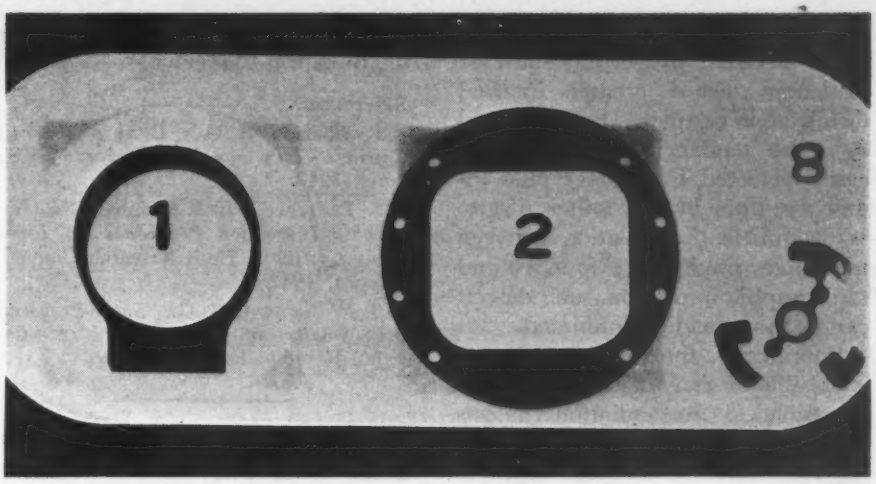
For the foundry establishing a radiographic inspection control laboratory, the selection of equipment, x-ray film and accessory apparatus is entirely dependent on the type of material they are casting. For the foundry casting light alloys, a machine of the 140 kilovolt variety will serve the purpose best. Such a machine preferably should be stationary, as the light alloys are easy to transport and a stationary unit would eliminate the possibility of having to perform radiographic inspection all over the foundry. If this is not feasible, a mobile machine of the same capacity may be secured.

For the foundries casting ferrous metals, where castings are not so transportable, radiography with radium is ideally suited. The radium capsule, slide rule and film are easily transported to the scene of inspection and may be rented from reliable supply houses at a nominal fee. Radiographic inspection technique with gamma-rays is relatively simple, and can be carried out with little difficulty once the technical difficulties have been worked out satisfactorily.

The amount of accessory apparatus, film dryers, etc., together with size of processing tanks, will depend entirely upon the size of the foundry and the volume of inspection being conducted.

Variation in Cost

The expense of installing a suitable x-ray inspection laboratory for the small foundry casting light alloys may, depending upon the type of equipment, be as low as $2,000 to $3,000. For the small steel foundry, provided radium is used, the expense should be somewhat less. A 100 milligram capsule of radium may be rented on a yearly lease at $25.00 per month.



Three castings not radiographed in the foundry nor by the customer, but which, when undergoing final machining, were ordered radiographed by an inspector. No. 1 contains cavities, evidently gas; No. 2 shows numerous gas and shrinkage cavities and inclusions of dross and sand; No. 8 shows gas blows, shrinking and dross. The loss in man-hours incident to casting and machining these specimens is worthy of note. All castings were rejected.

It must be remembered that inspection, as desired, should be a matter for consideration.

The technical details of radiographic inspection are not primarily the concern of management; however, the executive measures, necessary to coordinate such inspection with sound foundry control are very much management's concern. While it is common knowledge that there are not available sufficient skilled radiographers to meet the demands of each small foundry, there are, at this time, technical advisors who, acting as consultants, are available to visit the various small foundries for the purpose of working out the details of technique. In this way, the knowledge of a few can be apportioned to the needs of many.

Rejections Are Costly

Foundry variables, such as location of gates, risers and chills, the temperature of the pour, the physical properties of the sand and cores used, the ramming of the mold and the design of the part are but a few of the factors influencing the homogeneity of the resultant structure. All foundrymen know the distressing frequency with which these factors are seemingly not controlled, despite their best efforts.

As a result, there are many castings which are rejected by the prime contractor in his radiographic inspection or machining operation. *When the rate of rejections is high it is costly to the foundry, and the integrity of the product is impaired.*

During the past few years development programs have been conducted to minimize casting difficulties and to remove doubt concerning the internal continuity of the metal. The role of impurities has become more fully realized; new types of alloys have been developed; heat treating has become a dependable art; molding and melting techniques have been improved and the radiographic non-destructive test has replaced the former method of sectioning.

For many years it has been a practice—and an expensive one, if carried to complete satisfaction—to section trial castings for the purpose of testing the correctness of the foundry procedure and the quality of the product fabricated. When carried to practical limits, there has always been a question as to the thoroughness of the method—first, because the amount of information obtainable is almost directly proportional to the number of cuts or fractures made and, second, because of the possibility that the accepted castings may have contained some discontinuity overlooked, in the pieces examined. The realization of these limitations caused the industry to seek a reliable non-destructive method of inspection. To meet these demands, radiography entered the foundry.

The increasing use of complex alloys and pattern of intricate design are taxing the foundryman's skill to produce sound castings. Up to the

present, most alloys which develop high physical properties show a tendency toward greater internal shrinkage in castings. Defects caused by these tendencies can be more easily detected by radiographic inspection than by any other means. With sufficient correlation between techniques used in the foundry and radiographic inspection, such defects can be more readily eliminated.

Specifically, the radiographic test is capable of showing, in any section accessible to the radiation, defects such as shrinkage, tears, cracks, piping, gas cavities, chemical segregations, inclusions of dross, sand flux or of a metallic nature.

The intelligent administration of radiographic inspection in the foundry can well have a direct bearing on the amount of business the foundry might expect to receive.

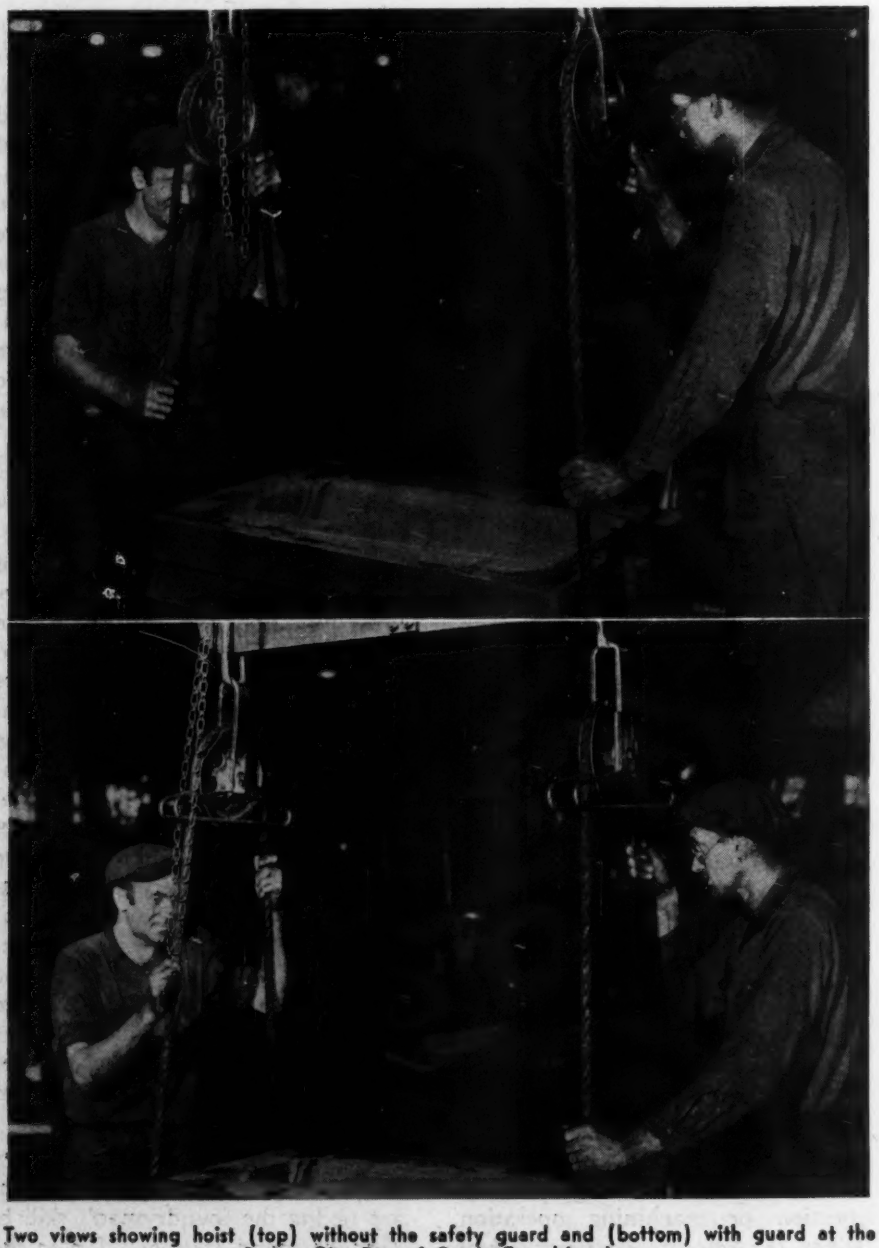
References:

1. Boulton, B. C., *"X-ray of Aircraft Castings—Its Control and Value,"* J.A.S., June, 1942.

2. Laurence, Ball & Archibald, *"Radiographic Inspection Procedure for Light Alloy Castings,"* Nat'l Research Council, Ottawa, 1942.

3. Williams, J. H. G., *"Some Problems in a Small Gamma-Ray Dept.,"* INDUSTRIAL RADIOG., Fall, 1942 issue.

Fred T. Goes, formerly vice president, Vilter Mfg. Co., Milwaukee, has been elected president. Other officers of the company are E. B. Tilton, executive vice president and treasurer; E. F. Vilter, secretary, and W. H. Wenzel, asst. secretary.



Two views showing hoist (top) without the safety guard and (bottom) with guard at the Spring City Div. of Grede Foundries, Inc.

Guard Saves Fingers At Grede Foundries

IN THE accompanying picture is shown a yoke equipped with pulleys, as it was used for years at the Spring City Division of Grede Foundries, Inc., in Waukesha, Wisconsin. During these years many fingers were injured and a few were lost. They were caught in the pulleys when the hands were moved upward along the ropes as molds were lifted or turned.

The lower view shows the same equipment after it had been provided with a simple but effective guard. Now the hands first contact the guard before they reach the pulley and time remains for their removal before fingers are caught. Since the installation of these guards no such injuries have occurred.

Works Manager Oscar Wochlke, Foundry Superintendent Wm. Senderhauf and Maintenance Foreman Albert Reap pooled their ideas in developing the guard. Superintendent Senderhauf had keen appreciation of the dangers since, when a molder, he caught and lost a finger through a similar unguarded pulley. Now he and the others wonder why this simple solution was not adopted years ago.

Like many guards, this one did not at once attain its final form. It was first tried out as a straight bar with ends protruding. The rounded continuous loop was then adopted to eliminate the danger of bumping head and eyes on the ends.

The pictures and detail are submitted by Grede Foundries, Inc., which operates four foundries in the Milwaukee area. They are offered as evidence of practical results which are being obtained from increasing interest in safety and the resultant conservation of manpower.

One of the most popular mediums employed to tell employees about the company and its problems is the employee magazine, according to a survey conducted by the Policyholders Service Bureau of the Metropolitan Life Insurance Co. The methods and media used to build better employee relations are reviewed in the Bureau's "Telling Employees About Their Company." Copies are available from the company, 1 Madison Ave., New York.

Time Study Applied to Cost Control

by PHIL CARROLL, JR.

Declaring Timestudy to be a common denominator for measuring production through improvements in methods and processes, this article advocates cost control through the application of its principles. The work is reprinted from "Advanced Management."

IT is refreshing to discover that some people are interested in controlling costs. It began to look as though no one was taking much interest in cost.

Certainly, the time will come when we will have to concern ourselves with cost because some day industries will again be competing with each other. But what is more important, perhaps, is that after the war we will have to compete with other nations to whose industries we have supplied the money, equipment, and technology to set up in high gear.

In competition, most of us recognize that time study can play an exceedingly important part. Most of us automatically think of time study when the subject of wage incentive is mentioned.

Cost Control

All of us are aware of the frequency with which "incentive" is mentioned today. But, using time study for simple incentive only is like having a Cadillac automobile with no more gasoline to run it than is allowed by an "A" ration.

Time study is important and necessary to the successful operation of good wage incentive. The point is, however, that the facts and results obtained from time study effort can be made also to do a much greater and important job. The facts and measurements obtained can be beneficially applied to cost control in almost all of its extensions.

Webster defines control as "To exercise restraining or directing influence over—to regulate." The definition we hear every day is "To keep our fingers on."

Reduction and Control

To keep in touch with what is going on requires that someone make comparisons with standards of some kind. Comparisons of this sort are measurements. The measurements involve comparisons of the variations from standard with the standards themselves to ascertain volumetric or percentage change.

My interpretation of cost control goes a step further. The reason is that successful control must consider a level of performance. In other words, we cannot stay in business at high costs. It seems apparent, then, that the term cost control implies also the meaning of progressive reductions in cost as well as the maintenance of those gains.

Here is where time study enters with its important contributions. Time study with good wage incentive operation brings about one of the first and foundational parts of cost control, namely, performance measurement.

Good time study analyses also act as sieves which separate into proper classifications many of the cost facts necessary to cost control. Proper time study measurements, with or without incentive, supply factual standards for comparison. Lastly, but not the least important, time study standards with incentive performances supply the conversion times required in the manufacturing processes.

Performance Measurement

The effectiveness with which we work is a basic factor in success. The degree to which performance approaches ideal determines very largely the success of the effort, whether individual or industrial. It is here that time study begins its effectiveness through the use of the time observations for the establishment of incentive standards.

The beneficial effects of time study with incentive in many phases of cost reduction are well known. However, the benefits in the field of control are not nearly so well understood.

The control arises primarily through the lessening of the variations in cost. This advantage might be more clearly understood by contrasting performances under day work with those obtained on incentive. Without the benefit of incentive, output performance may vary from a low of 20 per cent to a high of perhaps 100 per cent of a normal day's work.

On incentive, however, individuals usually attempt to surpass the standards established. Also, performances above standard are usually compensated for in full value. The result is that, in general, labor costs are practically constant with good incentive operations. The variations occuring in the main are those which result from delay time, re-work and the assignment of skilled people to lower-grade jobs.

There is another important factor resulting from the higher earnings which incentive workers strive to maintain. The incentive earnings are as definitely a part of a higher standard of living as is a raise in salary. As a result, performances become stabilized within fairly close limits so that the whole structure of a business can be geared to a practically uniform rate of production output.

Extent of Measurement

Of course, high earnings make for better morale and a more stable group of employees, provided other conditions are acceptable. It follows, then, that one of the most important jobs of the time study man is to furnish the maximum opportunity during which incentive earnings can be attained.

To attain the maximum benefits of high earnings and controlled costs, the time study man must strive for total coverage by time study and incentive. This applies to indirect labor as well as to that which we call direct. Naturally, to approach the maximum coverage for direct and indirect, one must consider the most economical methods of good measurement.

Cost of Time Study

At the same time, considering the main theme of cost control, it is necessary to keep an eye on the cost of time study itself. In that connection, the cheapest total coverage, as well as the most consistent, can be

obtained by the method known as standard data.

It is pretty generally understood that the standard data method gains its consistency and economy by using over and over again a relatively smaller number of completely detailed and properly analyzed time studies.

Standard Data Method

The standard data method is almost necessary for the proper measurement of indirect labor. This particular phase of time study is becoming increasingly important, if one may judge from the frequent references made to it in the newspapers. The references have to do with rewarding people engaged in such work as setup, inspection, maintenance, tool-room, and similar work.

Work of this kind, especially the non-repetitive type, cannot be measured successfully by direct time study. That statement hinges upon the fact that good incentive practice requires that the time standards be made available when the job starts. For non-repetitive jobs, this can be done only by predetermining the standard time, preferably from recorded standard data.

This surge of interest in incentive for indirect labor is important technically because it may force many who call themselves time study men to adopt the more efficient method for increasing their own output per hour, as well as turning out standard times which are greatly improved from the standpoint of fairness and consistency of work requirement.

Incentive for Indirect Labor

At the same time, we cannot think of cost control as such and go along with the plant-wide incentive plan advocated in some quarters. There is no argument about indirect labor's right to incentive. If we believe in incentive as a basic principle, then there can be no exceptions to the rule.

Nevertheless, the point is that the plant-wide incentive plan advocated provides neither control nor cost reduction. It has all the appearances of a subterfuge to increase wages.

Paying a bonus to indirect labor which is equal to the percentage earned by the producers served is a "quickie" but no solution. Moreover, it is not a new device. It has been used for years to maintain a differential between machine operators and setup men, for example. But neither control nor incentive exists in such setups as is borne out by the fact that frequently the setup men do not give good service.

Besides, they become as tired of working as you and I, with the result that the number of setup men per producer continues to increase. Of course, by the formula, all of the original setup men plus all of the new ones have the percentage earned by the producers added to their wages.

On this score, we cannot object to a plan approved by the War Labor Board for paying bonus to crane men. The point here is that it would be difficult for additional crane operators to get into the crane cabs without getting in the way of those already working. A contrasting illustration is taken from *The Reader's Digest,* March 1943, an article entitled " 'Featherbedding' Hampers the War Effort." You would profit from reading this article which includes the following two paragraphs:

"When the revolutionary Diesel electric locomotives were developed, their fast, smooth power was recognized to be ideal for passenger trains. The larger models were built with power units, all of which were controlled by a small lever in the forward cab, very much as one motorman runs a subway train.

Training Costs

"A year or so ago the engineer's and firemen's union served notice on the country's most important railroad that an assistant engineer and a fireman must be employed for each unit of the Diesel locomotive. On a four-unit locomotive, this would mean a 10-man crew, including the electrician some railroads are now using. Each of the crew would have little to do but ride. When the railroads refused to employ the extra men, the brotherhood appealed."

The important point here is that the degree of control hinges directly upon the degree to which measurement approaches total coverage.

Going back to the subject of performance, there is another element of cost control which is exceedingly important at this time. This has to do with the training of new people. Much has been said about selection, induction and training, but one hears very little about measuring the results.

On the other hand, we frequently hear objections to measuring the performance of newcomers by incentive standards. Now or at any time, performance against time study standards measures the progress of the learner. By watching the rate of improvement, it is possible to see if the new employee is making normal progress. If not, it may be that the trainee is improperly placed in his job or that the instructions given have not been adequate. At any rate, this important method of measurement would not only save many mistakes in placement, but also would bring about a better control of training and instruction costs.

Part of Training Program

Time studies can be made to fill another important part of a training program. When properly made, they contain complete element descriptions written in the proper sequence. This information has been used extensively in some plants in the training of new employees in correct methods. It can play an important part of cost control in avoiding the retraining of people who have been allowed to stumble into the methods they use in performing work operations.

Perhaps the next most important application of time study to cost control bears directly on that well-known principle stated as "management by exception." We run into it every day in our work and see it referred to in the trade literature. Our contacts with it bring on negative reactions. We see the principle at work when we say, "The boss never tells you when you do a good job. All he does is criticize when things go wrong."

Measuring Variables

Management by the exception principle means that there is little work to be done when costs are in line. Conversely, everybody should get busy when costs are rising. We've all seen exceptions to the rule where nothing is said regardless, but this discussion has to do with the "exercising a directing influence over."

Naturally, management cannot exercise control if the facts are not made available. That is where we

reiterate the importance of good time study work.

Correctly-taken time studies separate the variations from normal working conditions. Good wage incentive standards do not include these variations. They must be allowed when occurring, however, for the protection of the producer. Allowances must be made for delays, indirect labor done by the producer, and variations in the work requirements in the operations themselves. As such allowances are required, they show up as variations which increase the cost.

Cost Reduction

Right here is one of the large sources for cost reduction and the control of costs. Frequent experiences in helping to change from day work to incentive have shown that uncontrolled delays were in excess of 10 per cent. Indirect labor performed by the producers has amounted to 20 per cent of their total time under the same uncontrolled conditions.

The extent of variations from normal working conditions cannot be stated as a percentage because it fluctuates too widely according to circumstances. Such wastes arise from faulty material, excess stocks, extra work, faulty workmanship, and other types of unnecessary effort.

The costs of such elements of work would be zero only in the perfect shop. Nevertheless, the point is that these excesses show up with good, analytical time study measurement.

Wasted efforts, unlike the elements of wasted work mentioned, are being overcome in many instances by good motion study work. Motion study as a technique is an excellent endeavor. However, some of the less skilled practitioners overlook the fact that without time study, there is no measure of accomplishment, no control of operation and no incentive to make it effective.

Control of Variables

Too many self-styled experts in motion study not only refuse to learn time study, but deliberately refrain from recognizing the importance of incentive first, in securing the full effectiveness of their efforts, and second, in maintaining them.

When time study with good incentive is used, management has available to it a separation and a measurement of variations in working conditions. From the standpoint of our theme, this brings about two important results:

1. Discloses the presence and amount of excess costs.
2. Permits the comparison of the excess with the cost to reduce or eliminate.

From the standpoint of cost control, the latter is constructive. It has an important effect upon the total unit cost. To recognize fully the importance of this element of control, we must do a bit of self-criticizing.

Most of us who work diligently at time and motion study push hard to get our own pet ideas accepted. Others do too, because it is a natural impulse. Herbert Moore, in his book entitled *Psychology for Business and Industry,* on page 299, lists as third in importance of the things we want in our job the "opportunity to use your ideas." However, some of these ideas are very costly.

Job Comparison

The reason is that many of those engaged in time and motion study are young and inexperienced men. They, like us, are inclined to look at the improvement imagined from only one point of view. In contrast, we must look at the total unit costs. In this, time study facts help greatly in deciding the economy of an improvement. By comparing the dollars and cents cost of doing the operation both ways, certain mistakes will be avoided. Then, the total unit cost will not rise because we have saved the overhead expense of excessive tools and equipment.

An illustration may serve to emphasize the point. In one plant some time ago the best available judgment pointed to the purchase of an automatic machine for pickling sheet steel parts. When installed, this machine worked effectively and was operated by two men. Later on, detailed time studies revealed that one man working without the machine could turn out more production than two men could with the $5,000 pickling machine.

We need to carry the self-criticism a little further if we are to gain the most from time study applied to cost control. We must get away from doing so much time and motion study thinking in terms of the individual job. Solving *one at a time* gets no place in cost control. No appreciable progress is made because the degree of perfection sought forces us to improve upon improvements. Consequently we do not get on with the job of complete measurement.

One Job at a Time

This habit of perfecting one job at a time was built up in the high production industries. We should remember that at the last census most of our manufacturing plants were relatively small in size. Ninety-one per cent of all plants reported had fewer than 500 employees each. Under such circumstances, it is necessary to adopt methods which are suitable to total measurement with emphasis on ways of handling non-repetitive work. This needs emphasis because, unless coverage is practically complete, another advantage of time study in cost control is lost.

The advantage referred to is that of job comparison. Importance lies in the fact that rarely do two operators or two plants work exactly alike. Here we inject another form of standard data thinking by calling attention to the benefits to be derived by the parallel analysis of operations.

Total Output Measurement

For example, analyze what takes place in some of the larger corporations. In those companies, the same product is made in several plants. Jumping to conclusions, one would say that the plant having the lowest cost had the best methods. Such is not the case. Each of the plants has some portions of its total methods which are better than those used in the low-cost plant. Obviously, the cheapest total cost is obtained when all of the plants adopt the best practices used in each of the plants.

Carrying this thought a step further, it should be pointed out that job analysis is an important part of good job evaluation. My personal belief is that well-trained time study men are particularly well fitted to assist in making correct job evaluations.

Much emphasis has been laid upon the value of direct measure-

Douglas C. Williams, A.F.A. Fellow at Cornell University, studying the high temperature properties of foundry sand.

ment and incentive. Obviously, there is a limit to the practicality of this method. Even so, some time study men and some companies have progressed so far beyond the conception of practicality held by others, that one should not reach conclusions hastily.

Some conclude that it is not practical to measure certain operations that are studied and placed on incentive by others with ease and economy. However, the point is that time study measurements are much more useful for comparative purposes when the measure of productive operations is fairly complete.

A measurement of the standard time value of production supplies a common denominator against which to measure budgets of all other expenses. This summary of total production is a true measure of output. A true common denominator is very important in budgeting, overhead allocation, pricing, and control.

The absence of a common denominator is another of the weaknesses in the plant-wide incenitve plan being talked about so much nowadays. This weakness is pointed out in a letter addressed to the Editor of the *New York Times* published on September 5, 1943. The difficulty involved is explained in the following:

The WPB recently undertook to compare plane production by using pounds of planes produced. But there is no fixed relationship between the weight of a plane and the work involved. Pound for pound, fighters demand far more labor than transports, for example. And even if there should be an airplane plant making only one standard type of plane, there are continuous improvements in design and method of manufacture, which, everything else being equal, will result in increased output per man hour aside from any improvements in the performance of the individual worker.

Common Denominator

It is obvious that when more than one type of product is turned out, some universally applicable measure is required before a total can be computed. Most measures break down because they differ from one product to the next. This is not true of standard time per piece.

The time study standards used for wage incentive purposes furnish the one way in which to measure a total of work done. Such a denominator of output is maintained as a correct measure of work done through innumerable improvements in methods and process.

However, attention is called to the fact that a true standard time measure of production cannot include irregularities such as extra work, indirect labor, and non-productive elements. The measurement of output must consist only of productive efforts.

In this connection, it can be pointed out that it is practical and recommended that some work now called non-productive would be more properly classified as productive. This may be explained by saying that a broader definition of productive labor might read as "That which happens with regularity to the piece."

Overhead Reduced

Under that definition, it is correct to include certain operations of inspection, packing, painting, casting cleaning, and similar work that can be measured in standard time per piece. Transferring such direct operations from overhead to productive labor, permits better control.

It reduces the amount of overhead to be spread over direct labor and hence permits the computation of more correct product costs. By making the denominator larger and the overhead part of the fraction smaller, the errors commonly made in overhead calculation are correspondingly reduced.

With a proper denominator that truly measures productive labor, it is possible to get quite reliable and practical budgets for cost control. Of course, budgets are more nearly correct when that labor which is involved can be measured directly for use with incentive. However, time study is still of important use when direct incentives cannot be economically applied, because under those circumstances time study surveys can be made to determine the extent of waste time.

Expense Control

The results in both cases can then be related to the standard time measure of production as the index of volume of business. Then, it is recommended that incentive be established for reductions in cost. As these incentives become more effective, the expenses are better controlled.

Budgets established on rough measurement, such as tons, are not satisfactory. As the quotation pointed out, there are two great differences between the effort put into the conversion of the several types of tons added together. Then, also, budgets cannot be related directly in proportion to volume. Anyone who takes the trouble to plot curves of expenses related to volume will discover an inherent constant expense of considerable proportion.

Total Unit Cost

Those who establish budgets in years past without the formality of plotting results have found that allowances of so much per ton or dollar of direct labor are now making exorbitant allowances for operating expenses. That has happened because the volumes today are greatly in excess of any contemplated at the time the straight proportional allowances were established.

Most of the waste time should be eliminated from budgets before incentive is established for reductions in expense allowances. Otherwise the result will be much the same as can be expected in plant-wide incentive plans where premiums contemplated will be paid more for the elimination of inefficiencies than for increases in output.

Despite all of the emphasis heretofore placed on time study and direct incentive, it is important to mention that many other items of

cost besides labor are affected. We must not lose sight of the fact that manufacturing is a conversion operation. By that is meant industries are engaged in converting materials to suit the needs of customers.

The time of conversion is measured by time study standards. This time measurement is the equivalent to rent. Rent is something we all understand. Rent is a simple way of expressing the overhead cost charged for the use of plant facilities.

Process Time Shortened

Time study is particularly effective in shortening process time and helps in lowering the rent. This is accomplished by increasing production per hour which eventually results in even more production from the same plant or the same production from a smaller plant.

The effect of time study in this part of cost control is very important if the plant we have in mind is anywhere near the average. The average plant investment per productive worker is $10,000 according to Carl Snyder, author of *Capitalism the Creator*. From that standpoint, it is obvious that time saved in the process cycle has a material effect upon total cost.

Planning is another important by-product of time study and good incentive. Planning lowers waste time which again reduces the process cycles. It follows that the output per dollar of invested capital is increased. This, in turn, speeds up the rate of turnover of inventory.

Rapid Turnover

When speaking of rapid turnover, we should think of the speed with which the garment manufacturers work. From all appearances, they buy a few bolts of cloth, cut up and sew the garments and deliver them to the department stores where they collect the cash with which to pay for the purchases in time to take advantage also of the "2%-10 days."

In still another field, time study has an important effect upon cost control because it helps to force the standardization of design. In turn, this results in lowered engineering costs, reduced inventory and obsolescence, and stock-keepings.

Also, time study tends to bring about better tooling, equipment and similar manufacturing facilities. Moreover, when good time study practices are followed, total costs are further reduced by economically sound transfers of work from hand labor to machine performance.

Better Operations

Thus far we have touched on labor measurement, overhead control and better processing. But, another point in discussing conversion costs is the necessity for making a profit. Profit, as we know it, is the difference between cost and selling price. Unfortunately, however, both costs and selling prices are usually summarized figures, and, in many manufacturing concerns, the true costs of production and marketing are not known.

Time study standards are of great help in supplying the labor part for standard costs. Also, they are useful in standardizing wage rates. With incentive, standard times are helpful in controlling processing variables involving wasted work and through routing and planning in the control of waste time.

But overhead remains the big variable. Mention has been made of partial control by measuring indirect labor, partial correction by shifting certain indirect to productive labor and the budgeting of that part which is not measured. When all this is done, there remains much of an intangible type. Here is where correct analysis is needed for the proper allocation of overhead costs.

An engineering study is necessary in order to determine properly the correct allocation of overhead costs to products. Only then is it possible to learn what is the right cost. With more facts, a more intelligible control can be exerted over the segments of the business which make up the total volume. Here, the profits are modified by proper pricing as one course of action or by selective selling as the other.

Control of Profit

Time study standards come in again in the control of profit when they are used for measuring labor inventory. The standard times represent Labor-Work in Process. The work completed adds to Inventory. As it is shipped, it subtracts from the work-in-process inventory.

The common denominator method for measuring production output permits the sub-division of the business done into types. As a result, it is convenient to compare by types of business the cost of products turned out with the sales income for those products. The obvious benefit is the correct segregation and comparison of profit by types of business. Such measures lead to further constructive actions by managements that tend toward improving profits.

Measurement versus Incentive

Recently, one executive asked, "Should we perfect the job before we take the time study?" The attempt was made to answer the question, but another man took up the discussion. He said, "It seems to me that when we have to estimate a new job, it should be worked over by engineering and tool design with time study to furnish from standard data the times for all methods considered. In this way, the best combination of thinking should result. Then the tools, methods and time standards are determined for quotation purposes, and when we get the order, everything is already set up to go ahead." That is to me one of the best explanations in brief of how time study can be applied to cost control.

A.S.T.M. Committees Meet at Congress

TAKING advantage of the gathering of foundrymen at the Third War Production Foundry Congress, several committees of the American Society for Testing Materials held meetings during that period.

Among the committees dealing with foundry subjects which met are Sub-committee I of A.S.T.M. Committee A-3 on Pig Iron; Subcommittee VII of the same Committee on Microstructure of Cast Iron and Subcommittee XXII on the Elevated Temperature Properties of Cast Iron. In addition, Subcommittee VIII of Committee A-1 on Steel also held a meeting.

Meetings of these committees and subcommittees during the Third War Production Foundry Congress is evidence of the close relation existing between the American Foundrymen's Association and the American Society for Testing Materials, which is recognized by A.F.A. as the specifications-making body of the castings industry.

3 BABIES IN A YEAR!

Stork Visits the Canton District and Another A.F.A. Chapter Is Established

By K. F. Schmidt

THE evening of March 30 was the occasion of the birth of the 27th Chapter of A.F.A. at Canton, Ohio. This newest addition to the Association family will be known as the Canton District Chapter, and will draw from the estimated 65 foundry interests in the immediate vicinity.

The organization meeting staged on the above date was the culmination of a series of conferences between interested members of the Association and A.F.A. Secretary R. E. Kennedy. This new chapter had its inception in November, 1943, when actual negotiations were inaugurated. An organization group met with Secretary Kennedy on December 15, and arrangements for a petitioning meeting were made for January 27, 1944. At this turnout, which was addressed by Fred J. Walls, International Nickel Co., New York, the petition was signed and presented to Association headquarters for approval.

At the March 30 meeting, held at the Elks Club, Canton, Karl F. Schmidt, United Engineering & Foundry Co., Canton, presided as chairman. After the meeting had been called to order, Chairman Schmidt introduced N. F. Hindle, Assistant Secretary of A.F.A., who represented the Association at this occasion and congratulated the organizing committee, composed of:

K. F. Schmidt, United Engineering & Foundry Co., *Chairman.*
H. E. McKimmey, Carnegie-Illinois Steel Corp., *Vice-Chairman.*
Otis Clay, Tuscora Foundry Sand Co., *Secretary.*
H. V. Beasley, International Nickel Co.
Earl Brown, Union Metal Co.
I. M. Emery, Massillon Steel Co.
W. W. Hoover, Machined Steel Castings Co.

Since the district is not dominated by one large center, it is hoped that group meetings will be held in each area so that a more complete fellowship and better availability may prevail. It is for this reason that the chapter officers and directors were chosen geographically, and it will be the aim, when the new bylaws are written, to maintain such a division during the life of the chapter.

The following officers and directors were elected by unanimous vote:

K. F. Schmidt, United Engineering & Foundry Co., Canton, *Chairman.*
A. H. Lankford, Wooster Products Co., Wooster, *Vice-Chairman.*
H. G. Robertson, American Steel Foundries, Alliance, *Vice-Chairman.*
Geo. M. Biggert, United Engineering & Foundry Co., Canton, *Secretary.*
Otis D. Clay, Tuscora Foundry Sand Co., Canal Fulton, *Treasurer.*

Directors from the different areas are:

W. W. Hoover, Machined Steel Castings Co., Alliance.
Lewis Way, Columbiana Foundry Co., Columbiana.
John R. Kerr, Deming Co., Salem.
I. M. Emery, Massillon Steel Castings Co., Massillon.
H. E. McKimmey, Carnegie-Illinois Steel Corp., Canton.
F. J. O'Mara, Canton Malleable Iron Co., Canton.
C. F. Bunting, Pitcairn Co., Barberton.
Edw. H. Taylor, F. E. Myers Co., Ashland.
Charles Reyman, Jr., Atlantic Foundries, Akron.

After N. F. Hindle presented the "family" cast iron baby rattle to Chairman Schmidt in behalf of the Association, to be retained by the Canton District group until another

Canton District Officers and Directors—Front Row: G. M. Biggert, Secretary; H. G. Robertson, Vice-Chairman; K. F. Schmidt, Chairman; A. H. Lankford, Vice-Chairman; Otis D. Clay, Treasurer. Rear Row, Directors: Chas. Reyman, Jr.; W. W. Hoover, I. M. Emery, Lewis Way, J. R. Kerr, C. F. Bunting, Ed H. Taylor, H. E. McKimmey.

new chapter joins A.F.A., the guest speaker, H. W. Dietert, Harry W. Dietert Co., Detroit, was introduced. Mr. Dietert discussed "The Behavior of Molds and Cores under Pouring Temperatures" and showed lantern slides. A discussion period followed.

The chapter will hold one more meeting during the current year, but the program committee is already functioning to secure speakers for the 1944-45 season.

Members and Guests Cooperate In Congress Housing Situation

THE American Foundrymen's Association wishes to commend those members and guests who cooperated so excellently under extremely difficult housing conditions to make the Third War Production Foundry Congress a success and a real contribution to the war effort. The Association regrets the conditions which existed, especially because it prevented many members of the industry from attending.

In order that the membership may have an understanding as to the conditions which existed, the following is a resume of the planning for this event, so far as housing is concerned. For the largest convention, at the largest Annual Meeting, from the standpoint of attendance, ever held by this Association prior to the Third War Production Foundry Congress, 1700 rooms were all that were required to have everyone attending suitably housed. When arrangements were made to hold the Third War Production Foundry Congress in Buffalo, Buffalo hotels committed themselves to supplying 2100 rooms. This appeared ample, considering past experiences.

Almost immediately upon announcement of the time and place of the Third War Production Foundry Congress, Buffalo hotels began to be swamped with reservations. When this situation was brought to the attention of those in charge of this event, a scheme was worked out whereby no reservations would be made until March 1, so that preferences in room reservations might be given to members of the Association and exhibitors at the Foundry Show. Reservations on this basis were to be made in accordance with the rotation in which they were received.

It should be pointed out that hotel reservations are difficult to obtain in any large city during these war times and the fact that the Buffalo hotels had guaranteed 2100 rooms seemed an ample number, not only for these strenuous times, but by all records of past experience. As March 1 approached, following the mailing of hotel reservations blanks to members, the number of rooms requested was almost double the number requested for the largest previous convention. With this situation facing it, the Housing Committee began assignment of rooms, going to hotels individually and securing even additional commitments over those already given. Still sufficient rooms were not available. The Committee then contacted hotels in surrounding communities, such as Niagara Falls and Hamburg, New York. With these additional accommodations, it was impossible still to supply the demand and a canvass was made of Buffalo to secure rooms in private homes.

Your Association, in an attempt to alleviate the situation facing the Housing Bureau, addressed a letter to each member of the Association and each exhibitor asking them to cut their housing requirements to the bone and immediately cancel all room reservations which were not absolutely necessary. It further suggested ways and means by which those attending could assist the Housing Committee, such as by vacating a room on the morning of the day of departure.

Much against the desires of the Association, it was even suggested that members forego the pleasure of their wives' company. In many instances, the Housing Bureau wrote to both companies and individuals requesting that they double up in order to secure additional accommodations.

It is interesting to note that the cooperation of both members and exhibitors was so excellent in answer to the request that several of the Buffalo hotels had the highest double room occupancy in their history. At this time, progress was being made to house all who had requested accommodations.

However, the Ordnance Dept. of the U. S. Army at this time requested 350 rooms of those reserved for the American Foundrymen's Association members and guests for occupancy during the week of the Third War Production Foundry Congress. This was an almost insurmountable difficulty. The Association sent out a second appeal to members and exhibitors to again consolidate their requests for housing facilities. As a further effort to alleviate the condition, the Housing Bureau maintained office and gave extraordinary service to accommodate members and guests as they arrived for the Congress in the Buffalo Memorial Auditorium.

From the above, it can be seen that everything possible was done to secure accommodations for those attending. The Association regrets the inconvenience caused many of its members and guests. However, under present conditions, in view of strenuous efforts made by your Association, it believes the best possible job was done under the circumstances, especially in view of the difficulties encountered in war-time housing problems.

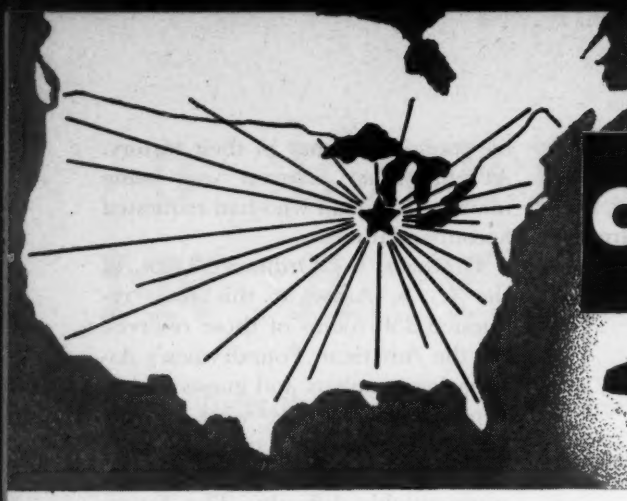
The Association again wishes to express to those who attended the Third War Production Foundry Congress its sincere thanks for the splendid sportsmanship shown under these extreme difficulties.

Foundry Contest for Technology Students

IN order to stimulate a broader interest in cast metals among students in the field of technology, the Twin City Chapter, A.F.A., is sponsoring its third annual contest.

Open to all undergraduates—civilian, Army, Navy—prizes will be awarded for the three best papers on subjects related to any phase of foundry practice, properties of castings, or uses of castings.

First prize is $20.00; second prize, $10.00; third prize, $5.00. Award winners will be guests of the Twin City Chapter at its Annual Student Night, May 24, and their papers will be presented during the technical session.



CHAPTER ACTIVITIES

News

See page 14 for list of Chapter representatives whose reports of local activities appear in this issue.

W. Michigan Studies Employee Relations

By C. H. Cousineau

THE March meeting of the Western Michigan Chapter was held Monday, March 13, 1944, at the Hotel Ferry, Grand Haven, with 106 members and guests in attendance.

Dr. Ralph L. Lee, General Motors Corporation, Detroit, was the speaker of the evening. Dr. Lee's talk was "Facing Facts in Employee Relations." He said that our greatest problem is to be able to analyze, classify and learn how to deal with men as individuals.

The speaker gave several facts which, when properly taken into consideration, would greatly improve the relationship of supervisor to men under him:

1.—Everyone is different, and the only one of his kind. Therefore, everyone requires different treatment.

2.—Most people are what they are because they can't change or be changed much. Some of our supervisors try to make all people over to what they want, but each person has different capabilities.

3.—No one individual is the same all of the time. A supervisor should take into consideration an employee's temperament at the time he approaches him. For instance, an employee who has suffered bad luck of some kind will not be in the same frame of mind as when he is free of worry.

4.—Everyone is proud of being different. The individual must have personal recognition from the supervisor.

Dr. Lee raised the following questions:

1.—Have we in our efforts to get out production and increase efficiency taken personal relations so much for granted, as a natural by-product of working together, that we have left them to shift for themselves?

2.—Is it possible that, without noticing or intending it, the work in our modern shops has become so thoroughly systematized, specialized and mistake-proof that it no longer requires sufficient contact between the individual and his boss to enable them to develop the close personal relationship which our facts tell us is the only cure for group relations difficulties?

The coffee talk, "Trends in the Foundry Industry," was given by Fred J. Walls, International Nickel Co., New York.

Quad City Chapter Hears C. O. Thieme

By H. L. Creps

THE Quad City Chapter met at Hotel Fort Armstrong, Rock Island, Ill., on March 20, with 68 members and guests in attendance. Subject for the evening was "Metallurgy of Non-Ferrous Metals in the Casting Foundry," by C. O. Thieme, H. Kramer & Co., Chicago.

Preceding the technical portion of the meeting, a moving picture entitled "Women in the Aluminum Foundry" was shown. This picture gave an interesting review of foundry operations at the Caterpillar Tractor Co., Peoria, Ill., where aluminum cylinder heads are produced. An unusual feature of the foundry is that 85 per cent of the employees are women.

In the technical discussion, Mr. Thieme covered the non-ferrous fields from the viewpoint of the metallurgist and foundryman. He discussed the problems of present day metallurgists, and mentioned that the casting of bells represents the greatest art developed in brass founding.

Mr. Thieme complimented the American Foundrymen's Association on the excellent work done by the committees on designs and casting defects. The speaker dwelled at length on the problem of gases in non-ferrous castings, and discussed various types of melting units, oxidizing and fluxing of metal. Mr. Thieme concluded his talk with a brief review of the physical properties of present day metals. An interesting discussion period followed.

W. E. Jones, Ordnance Steel Foundry, chairman of the meeting, announced a nominating committee for 1944. The committee will consist of Alex Matheson, French & Hecht, Davenport, Iowa, Chairman; Clyde Burgston, Deere & Co., Moline; and R. H. Swartz, Ordnance Steel Foundry, Bettendorf, Iowa.

Record Attendance At St. Louis Meeting

By J. H. Williamson

THE largest attendance of any regular meeting of the St. Louis Chapter was on hand March 9, when 205 members and guests gathered at the DeSoto Hotel.

As a surprise feature A. H. Sullivan, Production Service Specialist, War Production Board, St. Louis Div., arranged for two "coffee talkers" to explain the object of the proposed foundry training school to be established in St. Louis.

The speakers were Mark Brooks, Area Training Supervisor, W.P.B., and L. H. Dally, Ass't Mgr., St. Louis Div. U.S.E.S. This subject cre-

ated such interest that it was decided to try and arrange a meeting devoted entirely to this subject.

The speaker of the evening, M. J. Gregory, A.F.A. National Director and Plant Manager, Caterpillar Tractor Co., Peoria, Ill., assisted by Zigmond Madacey of the same company, thoroughly covered their subject of "Core Blowing." The talk, illustrated with slides, was very well received and created a discussion period of more than usual interest and length.

After the completion of the discussion period a sound movie showing the Caterpillar Tractor Company's cylinder head aluminum foundry in operation was shown.

Philadelphia Holds Two March Meetings

THE March 10 meeting of the Philadelphia Chapter, Engineers Club, Philadelphia, featured "Steel Castings." The meeting was well attended, indicating the popularity of the speaker.

Howard F. Taylor, of the Naval Research Laboratory, did justice to the possibilities of his subject, "The Future of Steel Castings." He discussed the market, the manufacture and the selling of the steel foundry product. He visioned a growing market for an improving product, and he foresees steel castings education of the purchaser through more fundamental but entertaining sales appeal.

Mr. Taylor visions greater specialization among foundries, each excelling in some molding and casting technique. He pointed out the need for greater fundamental knowledge secured by more generous application of research and he emphasized the desirability for foundrymen with better technical background. Young engineers must have a real stake in the foundry of the future.

The speaker pointed out an often forgotten truth, "The Industry will be what the will of the Industry makes it." New markets, new tools, new fundamental data and new brains will be lumped together to produce improved steel castings having the desired properties of greater quality at lower installation cost.

Mr. Taylor was introduced by the Technical Chairman of the evening, Clyde Jenni, General Steel Castings Corp., Eddystone, Pa. Chapter Chairman B. H. Bartells, University of Pennsylvania, officiated. The chairman accepted with regret the resignation of Director William Thomas who has left the North Bros. Mfg. Co. to take a new post within the jurisdiction of another chapter.

March 24 Meeting

A special meeting attended by over 250 people heard Mike Dorizais, popular geographer, give some pointers in the more newly coined field of geopolitics.

With his usual direct approach, Mike made clear the "why" and "how" of our fight for democracy. Mike gave names and dates, and warned against the underestimation of the enemy. He proved his points with pictures, leaving little doubt in the listeners' minds.

L. P. Robinson Speaks to Cincinnati Chapter

By Martin Milligan

EIGHTY members and guests gathered at the Cincinnati Club, Cincinnati, March 20, to hear L. P. Robinson, Werner G. Smith Co., Cleveland, speak on "Variables Which Enter into the Baking of the Core."

Years of experience in core room practice and an inimitable manner of speaking made "Robbie's" talk both profitable and enjoyable for those assembled. This third visit of Mr. Robinson, as a speaker before the Cincinnati group, is evidence of the chapter's appreciation of their guest.

Steel Featured at Rochester Meeting

By D. E. Webster

THE April meeting of the Rochester Chapter was held on Wednesday evening, April 5, at the University of Rochester. About 65 foundrymen met, after dinner at the Rush Rhees cafeteria, to hear Howard F. Taylor, U. S. Naval Research Laboratory, Washington, D. C., discuss "The Future of Steel Castings."

Mr. Taylor stressed the need for extensive study of foundry methods as a means of guaranteeing the future success of the industry, and pointed out the benefits to be gained from a thorough study of gating principles and improved methods of casting examination.

X-ray, and magnetic powder testing have provided a means of checking the soundness of castings produced with various foundry techniques, and the use of the atmospheric pressure principle in risers has assisted in producing inherently sound castings with a minimum weight of riser metal.

Recent developments for the removal of risers and pads by means

M. J. Gregory, Caterpillar Tractor Co., and L. J. Desparois, Pickands-Mather Co., St. Louis Chapter Chairman, inspecting blown cores at the March 9 meeting.

of the cutting torch have helped to lower cleaning costs, and to permit more efficient riser design.

The speaker said there is a need for vastly improved refractories and foundry sands in the steel industry, and the use of efficient deoxidizers should have careful study. Mr. Taylor's talk was followed by a half hour of discussion on a number of pertinent subjects.

Non-Technical Program At Eastern Canada

By A. E. Cartwright

A NON-TECHNICAL program of motion pictures formed the basis of the March 17 meeting of the Eastern Canada and Newfoundland Chapter, and proved enjoyable to the 144 members and guests present at the Mount Royal Hotel, Montreal.

The splendidly produced U. S. Steel Corporation picture, "Steel—Man's Servant," was the high-light of the evening. This picture was supplemented by several war production and combat record pictures supplied by courtesy of the National Film Board.

Gratifying response was reported on arrangements under way for the two-day Foundry Conference to be held at New Glasgow, Nova Scotia, and it is estimated that a gathering of over 100 will be present at the May 11-12 sessions.

Texas Meeting In Fort Worth

By H. L. Wren

THE Texas Chapter met at the Colonial Country Club, Fort Worth, March 31, as the guests of the Foundrymen of North Texas. Thurman Kilman, Texas Steel Co., Forth Worth, assisted by DeWitt McKinley, McKinley Iron Works, and Ted Williamson, Trinity Valley Iron and Steel Co., both of Fort Worth, took charge of arrangements for a turnout of 64 enthusiastic foundrymen.

The meeting was opened by F. M. Wittlinger, Texas Electric Steel Castings Co., Houston, the Texas Chapter Chairman. Mr. Wittlinger introduced C. B. Sanders, Lone Star Steel Co., Dallas. Mr. Sanders gave a short talk in connection with their plant operations, pointing out that it is the first coke plant to be located in Texas. He also mentioned that, as soon as possible, they intend to produce pig iron.

The principal speaker, C. E. Bellew, Air Reduction Sales Co., New York, covered recent applications of the Acetylene process in steel foundries.

Reporters on Chapter Activities

Officers and representatives of A.F.A. chapter and other foundry groups who report on local activities in this issue, are identified below:

Birmingham—H. B. McLaurine, Birmingham, Ala.

Cincinnati District—M. F. Milligan, The Lunkenheimer Co., Cincinnati; Chapter Secretary.

Eastern Canada & Newfoundland—A. E. Cartwright, Robert Mitchell Co., Ltd., St. Laurent, Que.; Chapter Director.

Western Michigan—C. H. Cousineau, West Michigan Steel Foundry Co., Muskegon, Mich.; Chapter Secretary.

Quad City—H. L. Creps, Frank Foundries Corp., Moline, Ill.; Chapter Secretary-Treasurer.

Rochester—D. E. Webster, American Laundry Machinery Co., Rochester; Chapter Secretary-Treasurer.

St. Louis—J. H. Williamson, M. A. Bell Co., St. Louis; Chapter Secretary-Treasurer.

Texas—H. L. Wren, Barada & Page, Inc., Houston; Chapter Secretary-Treasurer.

Wisconsin—Darold W. Thiem, Pollard Oil Products Co., Milwaukee; Chapter Publicity Chairman.

Wisconsin Nominates Officers and Directors

By D. H. Thiem

AT THE March 10 meeting of the Wisconsin Chapter, at Hotel Schroeder, Milwaukee, the nominating committee submitted the following candidates: President, Harry E. Ladwig, Allis-Chalmers Mfg. Co., Milwaukee; Vice-President, John Bing, A. P. Green Fire Brick Co., Milwaukee; Secretary, David Zuege, Sivyer Steel Casting Co., Milwaukee; Treasurer, R. F. Jordan, Sterling Wheelbarrow Co., Milwaukee; Directors, George Dreher, Ampco Metal, Inc., Milwaukee; Arthur Haack, Wisconsin Gray Iron Foundry Co., Milwaukee; Paul Rice, Milwaukee Chaplet & Mfg. Co., Milwaukee; A. M. Fischer, Chas. Jurack Co., Milwaukee.

The speaker of the evening was Dr. James S. Thomas, formerly head of Chrysler Engineering Institute and the Clarkson College of Technology. In his subject, "New Frontiers for the Smart Foundrymen," Dr. Thomas presented a sweeping outline of the industrial changes and improvements being made as a result of World War II, and pointed out the opportunities for future achievement.

Birmingham Discusses Magnesium Castings

By H. B. McLaurine

CHAPTER Chairman W. Carson Adams presided at the March 17 meeting of the Birmingham District Chapter, held at the Tutwiler Hotel.

John Wakeland, McWane Cast Iron Pipe Co., spoke on "Magnesium Castings." Castings from magnesium is a comparatively new venture in foundries in the Birmingham section, with the McWayne Cast Iron Pipe Co. being the only processors. The use of magnesium was initiated in the production of incendiary bombs for the defense forces, of which the company is turning out a large volume.

Mr. Wakeland said that his company had to learn the processing of the material in the hard way, and he pointed out the difficulties that are encountered in manufacturing these castings. Starting with the raw material, he followed through the process of conversion to the finished castings, and the foundry practice employed in this work.

The speaker stated that the supply of magnesium was practically inexhaustible.

Abstracts

NOTE: The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications.
When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, N. Y.

Aluminum Alloys

MELTING. *(See Non-Ferrous Alloys.)*

WORKING TEMPERATURES. *"Testing Aluminum Parts for Working Temperatures,"* Russell G. Anderson, PRODUCT ENGINEERING, vol. 14, no. 12, Dec., 1943, pp. 786-789.

A description of the technique for determining the working temperatures for aluminum parts by means of hardness tests and a brief discussion of its applications.

Analysis

SPECTROPHOTOMETRIC. *"Rapid Determination of Chromium, Nickel, and Manganese,"* R. H. Jacoby, THE FOUNDRY, vol. 72, no. 3, March, 1944, pp. 111-112, 178.

A quantitative determination of the amount of chromium, nickel, or manganese in a steel may be made by passing light of a restricted wave length through a suitably treated solution of a sample of the steel and measuring the absorption of that light by means of a photoelectric cell and a microammeter. The microammeter may be calibrated against Bureau of Standards standard samples of steel.

Brass and Bronze

BLACK COATINGS. *(See Non-Ferrous Alloys.)*

MELTING. *(See Non-Ferrous Alloys.)*

PRESSURE CASTINGS. *"Heat Treating Bronze Castings,"* J. W. Horner and Frank A. Mason, THE FOUNDRY, vol. 72, no. 3, March, 1944, pp. 109, 187-189.

The first part of this article describes defects in bronze castings which result from incorrect design, melting practice, or molding practice.

The remainder of the article describes the effect of crystal structure on the properties of bronze castings, and the type of porosity in castings which may result from a stressed condition or undesirable grain structure. This latter defect is one which may be remedied by heat treating to remove stresses and to refine or rearrange the grain structure. Porosity due to other causes remains unaffected by heat treatment.

PISTON RINGS. *"Piston Rings of Bronze,"* Tracy C. Jarrett, METALS AND ALLOYS, vol. 19, no. 2, Feb., 1944, pp. 351-356.

A pictorial article describing the production, analyses, and microstructure of typical bronze piston rings.

Cast Iron

FUEL ECONOMY. *"Fuel Economy in the Iron Foundry,"* Colin Gresty, FOUNDRY TRADE JOURNAL, vol. 72, no. 1430, Jan. 13, 1944, pp. 31-34.

This article is a slightly condensed version of a paper presented to a Regional Fuel Conference at Newcastle. The author has discussed the various ways in which fuel may be saved when fuel supplies are limited.

Iron foundries, as a rule, have little interest in fuel economy since fuel cost is such a small percentage of the total cost of a casting. However, considerable savings may be effected in cupola operation over a length of time by increasing the yield and reducing the number of runs necessary. Changes in cupola design can do much to increase melting efficiency.

Fuel economies may also be effected in the operation of core and mold drying ovens. No more stoves should be employed than are absolutely necessary. Stoves should be provided with temperature recording equipment so that drying may be done on a temperature-time basis. Fuel consumption for each unit should be checked periodically. Often such checks will indicate that some units are more efficient than others. The stoves should be properly maintained and all flues should be kept clean.

MELTING. *(See Cupola Operation.)*

Copper-Base Alloys

MELTING. *(See Non-Ferrous Alloys.)*

Cores

CORE BLOWING. *"Increases Corebox Life,"* Horace L. Dudley, THE FOUNDRY, vol. 72, no. 1, Jan., 1944, pp. 102, 169-171.

A description of a means for prolonging the life of core boxes used with coreblowers.

Cupola Operation

AIR SUPPLY. *"Cupola Operation and Control,"* R. C. Tucker, FOUNDRY TRADE JOURNAL, vol. 72, no. 1435, Feb. 17, 1944, pp. 135-139; discussion, no. 1436, Feb. 24, 1944, pp. 165-168.

A paper read before the East Midland Branch of the Institute of British Foundrymen.

A discussion of the importance and control of air supply in cupola operation.

Duplexing

MALLEABLE IRON. *(See Malleable Iron.)*

Hardenability

HIGH-CARBON STEELS. *"Effect of Several Variables on the Hardenability of High-Carbon Steels,"* E. S. Rowland, J. Welchner, and R. H. Marshall, METALS TECHNOLOGY, vol. 11, no. 1, Technical Publication no. 1662, 12 pp.

Results of an investigation of the effects of time at temperature, quenching temperature, and previous structure on the hardenability of 0.20 to 0.40 per cent carbon alloy steels.

Heat Treatment

BRONZE TREATMENT. *(See Brass and Bronze.)*

Lost Wax Process

PRECISION CASTING. *(See Steel.)*

Magnesium Alloys

CASTINGS. *"The Future of Magnesium Castings,"* D. Basch, THE FOUNDRY, vol. 72, no. 1, Jan., 1944, pp. 116, 199-202.

A general description of the advantages, disadvantages, casting considerations, properties, and service performance of magnesium-base alloy castings.

ELIMINATION OF DEFECTS. *"Producing Sound Magnesium Castings,"* J. Hayward, FOUNDRY TRADE JOURNAL, vol. 72, no. 1436, Feb. 24, 1944, pp. 161-163.

Porosity and flux and oxide inclusions are the most common defects in magnesium castings. Flux inclusions are usually the result of poor melting practice, whereas porosity and oxide inclusions are generally caused by improper molding and gating technique.

The author describes a melting technique which makes use of both a low and high melting temperature flux to remove oxides from the metal and to form a protective layer on the surface of the metal in order to prevent further oxida-

tion during melting. The author describes gating methods which gives a minimum of turbulence and which use either strainers or steel wool to filter out oxides.

MELTING. *(See Non-Ferrous Alloys.)*

Malleable Iron

DUPLEXING. *"Duplexing in Malleable Iron,"* Donald J. Reese, THE FOUNDRY, vol. 72, no. 1, Jan., 1944, pp. 98-99, 156-157; no. 2, Feb., 1944, pp. 122-123, 173-176.

The true value of the cupola as a melting unit for the production of malleable iron is not usually realized, partly because in the past the lowest quality of malleable iron has commonly been produced in a cupola, and partly because many of those producers who switched from air furnace operation to duplexing, using the cupola for the initial melting, experienced a drop in quality of their product. However, the cupola actually is capable of producing a Grade A product provided its operation is properly controlled.

In the January issue, the author explains that it is more difficult to control the carbon content of cupola iron than of air furnace iron, and describes how the carbon content may be controlled.

In the February issue, the author describes how elements other than carbon may be controlled in cupola melting. He discusses the effect of tapping intervals on carbon content. He also discusses the degree of control which may be expected from the secondary furnace in the duplexing process.

Metallography

POLISHING. *"Electrolytic Polishing Metallographic Specimens,"* L. A. Hauser, THE IRON AGE, vol. 153, no. 3, Jan. 20, 1944, pp. 48-54.

A description of electrolytes, variables of operation, recommended practices, advantages, and disadvantages of electrolytic polishing of steel specimens.

A bibliography on electrolytic polishing follows the article.

Metallurgy

DIFFUSION. *"Symposium on Practical Aspects of Diffusion,"* METALS TECHNOLOGY, vol. 11, no. 1, Jan., 1944.

Included in the Symposium are the following articles: *"Preface to Diffusion,"* by Robert F. Mehl; Technical Publication No. 1658, 10 pp.; *"The Influence of Gas-Metal Diffusion in Fabricating Processes,"* by Frederick N. Rhines, Technical Publication No. 1645, 16 pp.; *"The Degassing of Metals,"* by F. J. Norton and A. L. Marshall, Technical Publication No. 1643, 21 pp.; *"Diffusion in Relation to Changes in Microstructure,"* Marie L. V. Gayler, Technical Publication No. 1648, 5 pp.; *"Diffusion in Alclad 24S-T Sheet,"* by F. Keller and R. H. Brown, Technical Publication No. 1659, 10 pp.; *"Diffusion of Indium in Bearings,"* by A. A. Smith, Technical Publication No. 1640, 6 pp.; and *"Diffusion in Chromizing,"* by I. R. Kramer, abstract.

Non-Ferrous Alloys

COPPER-BASE. *(See Brass and Bronze.)*

MAGNESIUM BASE. *(See Magnesium Alloys.)*

ALUMINUM-BASE. *(See Aluminum Alloys.)*

MELTING. *"Melting Non-Ferrous Metals,"* J. J. Hall, METAL INDUSTRY, vol. 64, no. 3, Jan. 21, 1944, pp. 38-40; no. 4, Jan. 28, 1944, pp. 56-58.

Recommendations for furnaces, deoxidizers, and fluxes, and melting procedures for various non-ferrous alloys.

PROTECTIVE COATINGS. *"Characteristics of Black Coatings for Non-Ferrous Metals,"* Walter R. Meyer, PRODUCT ENGINEERING, vol. 14, no. 12, Dec., 1943, pp. 792-794.

A discussion of the characteristics of black oxide, metal complex, sulphide and telluride, and metallic finishes for non-ferrous metals. These finishes have proved particularly useful for war equipment by reducing reflection and improving corrosion resistance.

Piston Rings

BRONZE. *(See Brass and Bronze.)*

Polishing

ELECTROLYTIC. *(See Metallography.)*

Protective Coatings

BLACK COATINGS. *(See Non-Ferrous Alloys.)*

Radiography

GAMMA RAY. *"Radiography Aids Steel Casting Technique,"* G. W. McClearly, CANADIAN METALS AND METALLURGICAL INDUSTRIES, vol. 6, No. 11, November, 1943, pp. 23-26.

The author describes how a steel foundry used gamma-ray radiography to simplify their selection and correction of foundry technique.

RADIUM PROTECTION. *"Screening Materials for Use in Industrial Radiography,"* G. H. S. Price, THE METAL INDUSTRY, vol. 63, no. 22, November 26, 1943, pp. 338-339.

A discussion of the possibilities for using various dense metals for confining radium emanation to protect persons handling or transporting the radium.

Records

PRODUCTION PLANNING. *"A Method for Planning Foundry Production,"* "Ecossais," FOUNDRY TRADE JOURNAL, vol. 72, no. 1434, Feb. 10, 1944, pp. 125-126.

This article describes a method of assigning jobs and keeping records to insure delivery of castings on the promised date.

Refractories

STEEL PLANT. *'Chrome Ore and Chrome Magnesite,"* J. H. Chesters, THE IRON AGE, vol. 152, no. 20, November 11, 1943, pp. 68-71, and vol. 152, no. 21, November 18, 1943, pp. 52-55, 166, 168.

In Part 1 the author discusses the distribution, properties, condition and preparation of chrome ore. In Part 2 the author discusses the manufacture, properties, and applications of chrome, and chrome magnesite brick, and other chrome-containing refactories.

Risering

STEEL CASTINGS. *"Tests Graphite Rods in Producing Cast Steel,"* Frank J. Vosburgh and Howard L. Larson, THE FOUNDRY, vol. 72, no. 1, Jan., 1944, pp. 108-111, 194; no. 2, Feb., 1944, pp. 128 129, 187-188.

A series of tests was performed to determine the effect of rods in semiblind risers. These tests indicated that results obtained depend upon the rod material. Results were better when using graphite rods than when using either carbon or core sand rods. The shape of the rod was of little importance other than that round rods were less expensive. Size of the rod in relation to total riser volume was an important factor. Permeability of the rod was unimportant. Position of the rod was important. Best results were obtained when the rod was placed one-half the riser diameter from the top of the riser and from 2 to 3 inches from the center line of the casting runner.

When a graphite rod is used, the shrink cavity formed within the riser is flat-bottomed, rather than carrot shaped. Carbon absorbed from the graphite rod lowers the melting point of the metal and increases its fluidity. Combustion of some of the graphite increases the temperature of the metal and makes it more fluid. The increased fluidity of the riser metal and the atmospheric pressure on the fluid metal greatly prolong feeding time. The increased fluidity of the metal permits the use of runners having a smaller cross sectional area. Graphite rods are available in many sizes, are less fragile than sand rods, and are no more expensive when purchased in quantities.

Sand

CONTROL. *"Some Aspects of Sand Control,"* F. Thomas, FOUNDRY TRADE JOURNAL, vol. 72, no. 1434, Feb. 10, 1944, pp. 113-119.

An abridged version of a paper read before the East Anglian Section of the London Branch of the Institute of British Foundrymen.

The author describes the practical application of sand control in a steel foundry to maintain a correct and uniform quality of sand for the production of sound castings.

Scrap

STEEL. *(See Steel.)*

ALLOY SCRAP. *"Utilizing Alloy Steel Scrap,"* Victor E. Zang, THE FOUNDRY, vol. 72, no. 3, March, 1944, pp. 113, 134.

A description of attempts to use more alloy steel scrap in electric melting units.

ANALYSIS. *(See Analysis.)*

CASTINGS PROMOTION. *"Steel Castings for Present and Post-War Products,"* PRODUCT ENGINEERING, vol. 14, no. 11, November, 1943, 16 pages.

This article is an illustrated survey of possible uses for steel castings as affected by wartime developments and foundry methods.

HARDENABILITY VARIABLES. *(See Hardenability.)*

MULTIPLYING FACTORS. *(See Hardenability.)*

LOST WAX PROCESS. *"Precision Castings,"* L. L. Wyman and D. Basch, THE FOUNDRY, vol. 72, no. 2, Feb., 1944, pp. 116, 203-206.

The lost wax or investment method of centrifugal casting has been adapted to the production of small, complicated parts in high alloy steels which are not forgeable.

The patterns, which are of wax, are formed in highly polished, accurate metal molds of such size as to compensate for any change in dimensions which may occur in either the wax pattern, the refractory mold, or the metal cast. The patterns, including patterns for grates, risers, and sprues, are assembled in the form which the space in the mold for metal shall assume. The refractory mold is then built up around these patterns.

Usually the mold is made of two materials, one a high grade refractory which will give the desired finish to the casting, which will hold its shape when in contact with molten metal, which will not contaminate the molten metal, and which will not crack or spall during the casting operation. This material may be backed up with a lower grade refractory which forms the balance of the mold which is not in direct contact with the pattern surface. The pattern is removed from the mold either by melting or vaporizing the wax.

When the pattern has been removed, the casting operation is performed on a centrifugal casting machine similar to that used in making intricate jewelry or dentures. Usually the melting furnace is mounted at the center of the casting machine and the mold or molds are mounted at the end of a spinning arm. Passages to conduct the metal from the furnace to the mold cavities are put in place. When the metal is melted and at the proper temperature, the casting machine spins the mold and the metal is forced into the mold cavities by centrifugal force. Variations of this casting machine are used.

Castings made in this manner are of very good quality. They can be made with an accuracy of a few thousandths of an inch, and a minimum amount of metal is used in the process.

ORDNANCE PARTS. *"Improved Casting Techniques,"* by John L. Campbell, STEEL, vol. 113, no. 26, December 27, 1943, pp. 68-69, 101.

A discussion of improvements in methods and savings effected in the manufacture of cast steel breech rings.

SEMI-BLIND RISERS. *(See Risering.)*

Schedule of May Chapter Meetings

May 1

Central Indiana

Athenaeum, Indianapolis
ROUND TABLE MEETING

✦

Chicago

Chicago Bar Assn. Restaurant
ROUND TABLE MEETING
Steel—*"Foundry Maintenance"*
Gray Iron—*"Close Cupola Control and How to Get It!"*
Non-Ferrous—*"Aluminum and Magnesium Castings."*
Patterns—Subject to be announced.

✦

Metropolitan

Essex House, Newark, N. J.
"Light Metal Castings"

✦ ✦

May 3

Rochester

H. W. DEITERT
Harry W. Dietert Co.
"The Behavior of Sands and Cores at Elevated Temperatures"

✦ ✦

May 5

Western New York

Touraine Hotel, Buffalo

May 8

Cincinnati

Cincinnati Club, Cincinnati

✦

Western Michigan

Hotel Ferry, Grand Haven

✦ ✦

May 11

Northeastern Ohio

Cleveland Club, Cleveland

✦

St. Louis

De Soto Hotel, St. Louis

✦ ✦

May 12

Central New York

Onondago Hotel, Syracuse

✦

Northern California

Engineers Club, San Francisco
Sand Committee Program

✦

Ontario

Royal York Hotel, Toronto
Social Night

✦

Southern California

Clark Hotel, Los Angeles

Wisconsin

Schroeder Hotel, Milwaukee

✦ ✦

May 17

Quad City

Annual Picnic anr Outing

✦ ✦

May 18

Detroit

Rockham Educational Memorial, Detroit

✦

Texas

Golfcrest Country Club, Houston

✦ ✦

May 19

Canton

Elks Club, Canton
J. W. REINHART
War Man Power Commission
"Man Power in the Foundry Industry"
PROF. SCHALLENBERGER
Mount Union College
"Radar—What It Is and How It Works"

✦

May 27

Chesapeake

Hotel Belvedere, Baltimore
Annual Get-Together Party

AN UP-TO-DATE REFERENCE MANUAL

For the Modern

GRAY IRON FOUNDRY

A revised A.F.A. Committee publication of authoritative information on the properties, application and production of alloy cast irons.

This revised edition of the ALLOY CAST IRON book contains a correlation of practical knowledge advanced by outstanding authorities on the production and application of alloy cast irons. The 282 pages of text matter contain 96 tables and 123 illustrations, all dealing with the latest alloy gray iron manufacturing methods.

- The 6 x 9 clothbound book contains data on the qualitative and quantitative effects of alloys . . . forms available . . . methods of addition . . . casting practice . . . heat treatment . . . service and test data . . . specific applications . . . extensive bibliography . . . and a comprehensive cross index.
- Elements discussed include Aluminum, Bismuth, Carbon, Chromium, Cobalt, Copper, Magnesium, Manganese, Molybdneum, Nickel, Phosphorus, Silicon, Sodium, Sulphur, Titanium, Telurium, Tungsten, Vanadium and Zirconium.
- Just off the press, this revised edition of the ALLOY CAST IRONS book is a "must" in the gray iron foundryman's reference library. PRICE: $2.75 to A.F.A. MEMBERS; $3.25 to NON-MEMBERS.

Contents

1. METALLURGICAL PRINCIPLES OF THE EFFECTS OF ALLOYING ELEMENTS IN CAST IRON
2. EFFECTS OF ALLOYING ADDITIONS IN CAST IRONS
3. EFFECTS OF ALLOYS ON THE PHYSICAL AND MECHANICAL PROPERTIES OF GRAY IRONS
4. LADLE INOCULANTS
5. WHITE AND CHILLED ALLOY CAST IRONS
6. HEAT TREATMENT OF ALLOY CAST IRONS
7. FOUNDRY PRACTICE FOR ALLOY CAST IRONS
8. SPECIFIC APPLICATIONS OF ALLOY CAST IRONS
9. INDEX

AMERICAN FOUNDRYMEN'S ASSOCIATION

222 W. Adams Street Chicago, Illinois